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## ABSTRACT

The first of the six sections in this description of the national educational system in Finland discusses the system's goals, its structure and size, the curriculum in the comprehensive and upper secondary schools, and studies in higher education and at the post-graduate level. The second section describes the organization and funding of educational research, noting the roles of the Ministry of Education, institutes of higher education, and permanent research units. Teacher education is the focus of the third section, which provides information on the different groups of teachers in the country, eligibility for a teaching position, and the education of teachers for the kindergarten, comprehensive school, and upper secondary school levels. Major problems in the educational system are outlined in the fourth section. Computer education is described in the fifth section as a separate subject in the comprehensive and upper secondary schools, and information is provided on the state of computer education in 1987-1988, hardware and software configurations in the schools, and the current state of computer education in upper level and upper secondary schools and in the lower level of the comprehensive school. The final section makes projections about the state of computer education in the comprehensive and upper secondary schools in 1995. (8 references) (GL)

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FINNISH EDUCATIONAL SYSTEM AND COMPUTER EDUCATION IN FINLAND

by

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## 1. EDUCATIONAL SYSTEM OF FINLAND

### 1.1 Finland

The Republic of Finland, with an area of 337,000 square kilometers (130,116 square miles), is the sixth largest country in Europe and, apart from Iceland, the most northern country in the world. Regional differences due to climatic and other geographic influences are notable, affecting patterns of population and livelihood. Natural resources are modest, with thin soils and a short growing season. Small amounts of the most important minerals are found, satisfying a good deal of domestic demand. There is no oil, coal, or natural gas, all of which have to be imported. Forests are considered the principal national resource. The cultivated area (9 percent) is equal in proportion with that covered by inland waters, while forest and marshy land (covering 65 and 32 percent respectively of natural-state terrain) dominate the average landscape.

After some 600 years under Swedish rule and then 100 years of Russian domination Finland gained independence in 1917. Two phases (the Winter War 1939-1940 and the Continuation War of 1941-1944) of the Second World War resulted in the

loss of 12 percent of territory and the payment of heavy war reparations. After these traumatic experiences a determined, active policy of political neutrality toward and friendly exchange with other nations has characterized Finnish political, sociocultural, and economical policies.

In 1988 the population was about 4.9 million, with an average density of 14.5 persons per square kilometer but with half of the population living in one-tenth of the total area, in the south. There have been dramatic changes in urbanization and occupational structure. In 1920, the urban/rural distribution in percentage terms was 15:85; in 1950, it was 30:70; in 1970, 50:50; and in 1980, 60:40. The general trend of movement away from rural areas not only boosted urban centers but resulted in emigration (notably to Sweden), which within 25 years (1955 - 1980), totaled over 300,000 people, mostly of working age.

There are two official languages: Finnish, spoken by 93.5 percent of the population and Swedish, spoken by 6.3 percent. Both are compulsory in education, and each language group has its own schools but with similar curricula. The Constitution provides for a parliamentary system with a unicameral legislature of 200 members, elected by those over 18 years. The President holds

supreme executive power. He appoints the members of the government who represent the 12 ministries. There are 12 provinces and 461 municipalities, the latter having representational self-government. Eight parties are currently represented in the parliament, with a wide range of philosophies from Marxist left to moderate conservatism.

Finland has a mixed economy, based on free enterprise and private ownership, but with considerable state involvement in planning and financing in many sectors. In industry, the state is the owner of only a few companies. In 1965, 98 percent of arable land and 60 percent of the forests were privately owned; 75 percent of industrial workers were employed by private firms and 10 percent by state companies. Since 1960 industry has replaced agriculture in economic importance. The main industries are wood, metal, food, and chemicals. The high technology has rapidly increased its meaning in Finnish economics and trade. The per capita gross national product (GNP) in 1986 was about \$ 14,300, making Finland the 9th wealthiest nation in these terms. Foreign trade is of vital importance to Finland, which has a narrow production structure and a small domestic market. It has to import energy and raw materials. Its main trading partners were: the European

Economic Community; European Free Trade Association;  
Council for Mutual Economic aid and developing countries.  
The main individual trading partners 1988 were Sweden,  
United Kingdom, the Federal Republic of Germany and the  
Soviet Union.

## 1.2. Goals of Education

The major principles of Finnish educational policy are:

- a) to secure, through continuous development, a level of education necessary for responding to the demands and mastering the process, of scientific-technological and social development;
- b) to promote educational equality in terms of a more balanced distribution of material and pedagogical resources;
- c) to develop the content of education in order to foster democratic values and progressive attitudes, while responding to the demands of universal human rights and of international exchange and cooperation;
- d) to develop education so that more and more people will

have their share of the various cultural facilities and be able to assume an active role in the continuous development and enrichment of culture.

Such principles underlie the profound developments which took place throughout the Finnish educational system in the 1970s and early 1980s. During this process, the old parallel school system gave way to a new comprehensive-school system, secondary education acquired new depth and relevance, and higher education underwent changes to make it more effective and responsive to the needs of society. In general, public interest in, and the status of education is very high in Finland, and educational services are greatly valued as part of the privileges a society can offer.

### 1.3. Structure and Size of the Educational System in Finland

#### 1.3.1. Structure of the Educational System

The Finnish education system is made up by a 9-year comprehensive school, upper secondary education consisting of a 3-year upper secondary school and vocational education institutes and schools, institutions of higher

education and different kinds of adult education institutions. The system of higher education consists of 17 institutions of higher education and three art academies. All the institutions of higher education and three art academies are state institutes working under the Ministry of Education.

Ten of these institutions consist of several faculties: Universities of Helsinki, Turku, Vaasa, Joensuu, Kuopio and Lapland, and Åbo Akademi (the Swedish university of Turku). The University of Helsinki is the oldest of these and has the most students; nearly all disciplines are represented there. The University of Oulu, Jyväskylä, Tampere and Turku as well as Åbo Akademi are medium-sized. The smaller type is represented by the Universities of Kuopio, Joensuu, Vaasa and Lapland.

#### 1.3.2. Preprimary Education

Strictly speaking preprimary education is not part of the educational system, since it comes under the Ministry of Social Affairs. At the beginning of the 1980s, there was no compulsory preschool education, although a system of day care centers existed, mainly for 6-year-old preschoolers, with a total of 120,000 places. The actual

need was estimated twice as much. Day care is financed generally by municipalities (which receive state aid), though sometimes by industrial enterprises, organizations, and individuals. There is no fixed curriculum, although unified objectives are stipulated. Activities are generally creative, designed to promote verbal and social skills. Teacher education is provided both in five kindergarten-teacher institutions and at six universities. Competition for entry is keen.

#### 1.3.3. Comprehensive School

The term comprehensive school denotes the post-1972 nine-year school providing compulsory education between ages 7 and 16. These schools cater for the whole age group, in contrast to the previous parallel branches of either primary (folk) and civic schools (6+2 or 3 years), or primary and selective junior-secondary schools (usually 4+5 years). The new system was phased in between 1972 and 1977, starting with schooling in the less privileged areas. The comprehensive-school program is divided into a lower level (primary stage) of six years, with class teachers, and an upper level (lower-secondary stage) of three years, with subject teachers. A voluntary 10th grade is being introduced in the mid-1980s as a municipal

responsibility for educational and employment reasons. All students in an age group attend the comprehensive (or special) schools until their compulsory education is completed. In 1981 there were some 590,000 students in the 4870 comprehensive (or comparable) schools, including about 3940 lower-level and 590 upper-level units, some 290 special schools (for instance for the educationally subnormal and the deaf) and some 40 schools comparable to regular comprehensive schools (such as special training schools like music, art etc.). In 350 of these, lessons were conducted in Swedish. Special education, in principle, is integrated in the regular schools. Of the 95,000 pupils involved in some form of special instruction (16.5 percent of all pupils), the great majority (84 percent) are in part-time-remedial classes and the remaining 16 percent in full-time special education programs. About half of the latter (15,000) are mildly educationally subnormal, the other half being mostly disturbed/maladjusted, or having more severe forms of subnormality. The number of teachers totaled approximately 38,000, providing an overall student/teacher ratio of about 15:1. The comprehensive school is free of charge for all pupils. The municipalities, who own the schools, provide the learning materials and daily meals and other social services, such as dental care. In a sparsely

populated country, transportation has to be provided daily for 30 percent of the students.

#### 1.3.4. Upper-Secondary School

The three-year upper-secondary schools developed as the upper segment of the selective secondary schools, providing academically oriented education. With the comprehensive-school reform, and particularly with developments in the vocational education sector, they came to be viewed as units providing general (i.e., not vocationally oriented) secondary education beyond the compulsory, basic level. In 1981, there were 112,000 students and 5,800 teachers in the 463 upper-secondary schools, with an overall student/teacher ratio of about 19:1. Pupil selection is based on a minimum overall level of achievement at the previous stage, and thereafter on an order of merit, although there is some room of discretion. In the early 1980s, approximately 50 percent of an age group continued their studies in the upper-secondary school, which terminates in the matriculation examination, passed by 38 percent of the modal age group in 1981. In 1983-84, 5 percent of the students in the upper-secondary school repeated their grade, while another 5 percent dropped out, resulting in a total wastage rate of about 10

percent. 1981, 63 percent of the graduates were females. Successful completion of studies provides for a general eligibility for university-level higher education, subject to further specialized requirements.

#### 1.3.5. Vocational Education

Practically all vocational education, including temporary training and short courses, is institutionalized in Finland. A two-year apprenticeship scheme does exist, but the numbers involved have been very small although they expected are expected to increase in the future. Traditionally, there are two types of vocational institutions, one-third of which are owned by the state: a) vocational schools, which provide from one to three years of training, generally in skilled manual work, after the comprehensive-school course and b) vocational institutes (colleges), whose three- to five-year courses prepare students primarily for managerial and planning tasks. Entry is dependent upon a high standard of achievement at the end of comprehensive school, previous vocational education, or, in some fields, matriculation. Enrollments have increased rapidly, from 30,000 in 1950 and 55,000 in 1960 to about 146,000 in 1982. About 60 percent of these are in vocational schools and 40 percent

in institution-level training. The number of places available annually in vocationally specialized preservice education in the late 1980s is 70,000 (excluding higher education), well exceeding the concurrent 16-18 age cohort numbers. Both vocational and general-secondary education are being developed according to the comprehensive-school principle, in the sense of providing opportunities for specialized training at either a vocational institution or university. The fundamental educational goals and pattern of studies of each are comparable, and they provide relevant alternative channels to higher education.

#### 1.3.5. Higher Education

Implementation of the new functional pattern from comprehensive school through secondary education is taking place throughout the 1980s according to integrated planning. The total number of students in the 21 higher education institutions (17 are universities) in 1982 was about 87,500, 50 percent of which were female. The number of places available each year is about 13,700 (1989) corresponding to approximately 19 percent of the relevant age group. Access is subject to the numerus clausus rule and entrance examinations, while also requiring a student to pass the matriculation examination; there is a quota of

5 percent for those without this particular merit. Those coming via vocational education will have a restricted access to 20 percent of places from the early 1990s. The growth within higher education has been explosive, reaching an annual rate of 12 percent of all enrollments in the early 1960s. This was brought about by the rapid process of industrialization and urbanization and the growing attraction of the upper-secondary school, combined with the large postwar age cohorts reaching higher education age. Development of higher education has been characterized by quantitative growth, regional decentralization, administrative innovations, and degree-(study-) program reform.

#### 1.4. Curriculum in the Comprehensive and Upper-Secondary Schools

In the comprehensive and upper-secondary schools subjects are defined by law. Time allocations and optional subjects are laid down by decree. Thus, there is a national framework within which municipal authorities prepare their local curricula, subject to approval by provincial authorities. The new education law which came into operation in 1985 effected an increase in the powers of municipal decision making regarding time allocations and

the contents of teaching, and assigned schools more freedom in deciding on the grouping of their students. Although preserving a unifying and advisory role for the National Board of General Education, such innovations imply a trend toward decentralization of decision making in curricular matters.

In the comprehensive school, the syllabys is essentially the same for all pupils, though instructional methods are individualized. Starting in 1986, the earlier system of setting different levels was replaced by a program with relatively uniform objectives, intended to provide each student with a general eligibility for all further studies. Although the relative shares of different subject domains are increasingly difficult to determine as national averages, it may be estimated that languages take about 33 percent of all instructional periods, mathematics and science subjects 30 percent, social and humanistic subjects 12 percent, while art, physical education, and others, including optionals like computer education (in the last two grades), account for about 25 percent. Compulsory subjects comprise from 21 to 30 periods per week, leaving a maximum of four for the optionals. There is no terminal examination, regular report cards providing the final assessment. In 1978, less than 1 percent

repeated a grade.

In the upper-secondary schools, 35 to 43 percent of the curriculum is allocated to languages (depending on the choice of courses), 22 to 29 percent to mathematics and sciences, 18 percent to social and humanistic studies, and 18 percent to arts, physical education, etc., in the common program. About one-fifth of the courses are elective. Computer education has quickly gained a high status, and is offered by all upper-secondary schools. A new syllabus for the upper-secondary schools was adopted by most municipalities in 1987, again making it more difficult to determine precise national averages for various program choices. The terminal (matriculation) examination tends to accentuate the language bias. Written examinations are set by the National Matriculation Board and marked centrally as well as in the schools. A more extensive set of oral tests for the school-leaving certificate is given by the respective teachers. Instruction was traditionally organized according to grade groupings and streams. In 1982 a new pattern was introduced, comprising study-period units organized by grade, each unit involving 38 class hours per subject, with specified objectives. Each of the six units per academic year has its own combination of subjects and

content; completed units make up a course. This arrangement is meant to help students to assume personal responsibility for their learning and to facilitate the later transition to more independent higher education studies.

### 1.5. Studies in Higher Education

An extensive reform of basic degrees and curricula has been going on in Finland since the late 1970s. The basic degrees have been organized as study programmes, with the scientific and vocational elements combined as well as possible. The programmes consist of 160-180 study weeks (credit units) corresponding to 4.5 -5.5 years of full-time study. Studies are organized into general studies, subject studies and advanced studies. Studies also include practice as well as language studies (Swedish, English, Germany, French, etc.) intended for all students. Postgraduate studies lead to the degrees of licentiate and doctor. The reform has been implemented by means of discipline-specific degrees, of which there are 18 in all. In the field of medicine, dentistry, veterinary medicine, pharmacy, physical education, psychology and law, a degree is taken only in one degree programme. In other fields there are several (usually 3 - 10) degree programmes.

There are 260 degree programmes in all, 110 of these go by separate names and have specific contents. The length of studies is generally 160 study weeks, but in teachers' degrees consisting of two subjects, in psychology, technology and in most art degrees 180 study weeks and in veterinary medicine 220 study weeks. The optimal time of study in law is eight or nine terms, in dentistry five years and in medicine six years. The decrees pertaining to degrees stipulate the objectives, structure and extent of each degree as well as in which universities a given degree can be taken. The content and organization of education is defined in more detail in the curriculum of each degree programme, which is approved yearly by the education unit (faculty or special institution). The curriculum defines study modules, their objectives, extent and ways of taking them as well as the departments responsible for offering each module. In practice, a curriculum is divided into two parts: a relatively stable part (the requirements) and teaching programme, which changes yearly. Most institutions of higher education have their own permanent planning bodies which prepare the curriculum for each degree programme, organize follow-up on and assessment of education. In the connection of the degree reform, attempts were made to assess the need for development in higher education both from the view of

working life and scientific development. The viewpoint was emphatically nationwide. As the institutions of higher education have extensive autonomy, the focus of continual planning and follow-up is clearly on universities, faculties and departments. It is the task of the Ministry of Education to support and coordinate content development as well as to take care of matters pertaining to the structure of education and division of labour between different institutions of higher education. Nearly all teacher education in Finland is given in institutions of higher education. The degree of class teacher is a basic (Master) degree in education. Subject teacher education is given in degree programmes leading to a basic degree in humanities, theology, natural sciences, physical education or the arts and includes also teaching practice which makes it more extensive than other degree programmes. The three-year kindergarten teacher training is an institute-level degree but is partly given in universities. The degree programmes in theology lead to functions within the Church or in the society as well as to the teaching profession. Studies in the arts faculties consist of degree programmes in languages, history, culture and arts. In the social sciences there are degree programmes like mass communications and political sciences. In economics, studies are divided into degree programmes in business

administration and planning of enterprises and institutions, foreign trade and marketing, and macroeconomics. The education field includes degree programmes in educational administration, planning and research, adult education and special education, as well as degree programmes for class teachers and for subject teachers in household economy and handicrafts. Education in agriculture and forestry consists of degree programmes in agriculture, forestry, household economy, foodstuffs and environmental protection. Studies in the natural sciences are divided into fields of biosciences, geography, methodology, physics, chemistry and geology. Studies in technology can be grouped into architecture, construction and community techniques, machinery, processing, electricity and production economy. Studies in law, physical education, psychology, medicine, dentistry, veterinary medicine and pharmacy have also been organized as specific fields of higher education. Art studies cover music, theater and the industrial arts.

#### 1.6. Post-Graduate studies

Post-graduate studies are traditionally divided into two degrees: licentiate and doctorate. The licentiate degree is optional in the new system and the doctorate can thus

be taken without it. Everyone with a basic (Master) degree has the right to pursue post-graduate studies. The licentiate degree is optimally taken in two and a half years and the doctorate in four years. In reality the length of studies is significantly longer. The main part of studies consists of research. In addition to a thesis, both degrees include one year of studies in all. Post-graduate studies are pursued quite independently. Some disciplines have organized special doctorate programmes. In the academic year of 1982-1983, there were 5627 basic degree graduates (of these 47 percent were women). Licentiate degrees were taken by 342 (27 percent women) and the doctorate by 297 persons. The distribution of doctorates was: medicine 98, mathematics and natural sciences 78 and technology 37; all other disciplines 84 in all. Over one third of those who have taken a post-graduate degree obtained university posts, about one fourth other research posts and over a third found other jobs. There are great differences between different disciplines. The number of those who obtain posts outside the universities is on the increase, and this rate is to be accelerated by different measures taken by the public authorities.

#### 1.7. Educational Research

Apart from academic theses and isolated ad hoc research ventures related to curricular reforms in the 1940s and 1950s, educational research as a field of specialization dates only from the early 1960s. Its organization has the following pattern:

(a) Research is commissioned by the Ministry of Education or one of its central offices and is aimed at serving the system's planning needs.

(b) The Academy of Finland (under the Ministry of Education), as the central organization administering all public scientific endeavor, sets priorities for, coordinates, and funds research in the social (as well as other) sciences. Education was allotted less than 5 percent of these resources in the 1970s.

(c) Institutes of higher education, especially those with a faculty of education, have considerable research potential, given their personnel and expertise. Their main task, however, is related to pre- and in-service education.

(d) Permanent research units, with full-time research

officers, are capable of undertaking long-range ventures. The main unit is the Institute for Educational Research at the University of Jyväskylä, which absorbs about 80 percent of commissioned research funding.

Resources devoted to educational research have experienced a dramatic rise and fall, particularly in the commissioned sector, reaching a peak in 1974. In 1982, about 0.7 percent of the running costs of all statefinanced research projects were devoted to educational studies, comprising about 0.05 percent of public funds devoted to education itself.

## 2. Teacher Education

### 2.1. General Background

#### 2.1.1 The Different Groups of Teachers

The following are the most important groups of teachers working at different levels in the educational system:

Kindergarten teachers work at day care centers and similar institutions as teachers and educators of pre-school age children.

The comprehensive school has:

- a) class teachers who teach all of the subjects included in the curriculum on the lower level of the comprehensive school
- b) subject teachers who usually teach one or two subjects on the upper level of the comprehensive school, in certain cases also on the lower level
- c) special teachers who give instruction to children suffering from problems related to speech, reading, writing or other special problems in the comprehensive school as such, or in special classes or schools for children with several learning and adjustment problems
- d) student counselors on the upper level of the comprehensive school (lower secondary school).

Usually teachers of one or two subjects function as subject teachers and student counselors in upper secondary schools.

In vocational institutions there are:

a) teachers of general subjects (corresponding to the subject teachers of comprehensive and upper secondary schools)

b) teachers of vocational subjects who provide theoretical instruction in a given field

c) workshop teachers who provide instruction in work practice and methods

d) vocational teachers for both theoretical instruction and work practice in a given field

e) student counselors.

Other important groups of teachers are those working in various functions at institutions of higher education and in adult education.

Actual teacher education (pedagogical training for the teaching profession) is offered for kindergarten teachers, teachers in the comprehensive and secondary schools, as well as for most of the full time teachers working in vocational and an adult education. No pedagogical training

is required as a prerequisite for teaching positions in higher education or in certain fields of vocational training.

#### 2.1.2 Eligibility for a Teaching Position

The eligibility requirements for teaching positions are set down in decrees. These conditions vary depending on the teaching job in question, but for the same type of position they are identical throughout the country. The eligibility requirements may include actual teacher training, some other type of training or degree, knowledge of a specific language or languages, citizenship requirements, the completion of specific blocks of university studies, work experience, etc. A teacher is regarded to have formal competence and can be appointed to a specific teaching position when he or she fulfills the stipulated requirements.

When there are several applicants for a teaching position, all of whom are formally qualified, consideration is taken of their academic achievements, their ability to teach (for which a separate evaluation is given), as well as their teaching experience and other work experience in the field.

Teacher education provides permanent eligibility which there is no need to supplement or renew. Teachers are, however, afforded the opportunity to participate in voluntary further or supplementary training. For some groups of teachers participation in supplementary in-service training is part of their professional duties.

## 2.2. Education of Kindergarten Teachers

In 1977 private, state-supported seminars training kindergarten teachers became state-run institutes subordinate to the national Board of General Education. There are five of these institutes, and one of them has Swedish as its language of instruction. Institutes training kindergarten teachers may also provide instruction for other personnel working either in the field of children's day care or in a field closely related to it. The faculties of education at certain universities also provide basic education for kindergarten teachers.

The curriculum for kindergarten teachers both at institutions of teacher training and higher education lasts for three years, has basically the same content, and leads to the kindergarten teacher's diploma. The

curriculum consists of general studies, subject related studies, and a period of practical training. The practical training is arranged at day care centers or other appropriate locations, and it has a scope of approximately 30 study weeks (credit units). A part of the theoretical studies has been arranged in accordance with the course requirements for that subject at the institution of higher education in question.

### 2.3. Education of Comprehensive and Upper Secondary School Teachers

#### 2.3.1 Organization of Teacher Education at Institutions of Higher Education

A total of ten institutions of higher education, two of which are art academies, participate in the arrangement of teacher education. At eight universities there are faculties of education functioning as teacher education units in accordance with the Act on Teacher Education. Also the faculties in which the subjects to be taught are represented participate in arranging teacher education. However, the courses in education as well as the practice teaching which are part of the teacher education curriculum are always taken at a teacher education unit.

Those institutions of higher education which train comprehensive and upper secondary school teachers are presented in Figure 2 along with their geographical location.

A faculty of education which functions as a teacher education unit usually consists of at least two departments, one of which is a department of teacher education and the other a department of educational or behavioral sciences. There are four faculties with two departments of teacher education, of which the second is situated outside the university town. Thus, the network of teacher training institutes covers the country quite well. Two faculties of education have an additional third department devoted to some other closely related sciences.

In addition to training teachers, these faculties also bear the responsibility for teaching and research in education and other sciences represented in the faculty. At present, there are about 28 professors and 58 assistant professors working at the teachers education units. There are 395 lecturers and assistants. In addition to fulfilling other prerequisites, a lecturer in charge of practice teaching is also expected to be a competent comprehensive or secondary school teacher and to have

practice teaching experience. The fact that the reform of degrees has resulted in both lengthening and changing significantly the training of some groups of teachers presupposes that teaching resources will significantly increase from the present.

The teacher education network includes a total of thirteen state-maintained practice schools. These schools provide facilities for arranging both practice teaching and research, and they cover the grades corresponding to both comprehensive and upper secondary schools. The practice schools are part of the teacher education units of the institutions of higher education. In 1984 these schools had an average of 7900 pupils in the comprehensive and upper secondary grades, and they provided 2870 students with the opportunity to practice their teaching skills. There are about 670 full-time teachers. Together with the lecturers of the teacher education institutions, these teachers are in charge of practice teaching. The required competence for a position at a practice school is higher than that normally required for teaching positions at comprehensive and upper secondary schools.

The experiences which have accrued from the training of comprehensive and upper secondary school teachers having

become the responsibility of institutions of higher education have been positive. The fact that faculties of education function as teacher education units has become established and the fact that practice schools are part of the faculties has ensured the practical requirements necessary for arranging practice teaching, as well as for maintaining interaction between educational theory, research, and practice. The faculties of subjects to be taught have increasingly paid more attention to the fact that a large part of their students will become teachers. Unification of administration and organization has created the general conditions for the integrated reform of studies and degrees, and improved possibilities for the combination of scientific and vocational objectives in teacher education.

#### 1.7. Major problems in Educational System

At the beginning and the middle of the 1980s, the major problems in the educational system concerned fundamental structural and quantitative developments over the whole spectrum of formal and nonformal studies. The main needs were: improved access to education, improved flexibility in the organization of studies, and improved student financial and pedagogical support. In the 1990s, problems

are likely to concern issues of detailed and concrete program development and implementation, in which teaching strategies and student-learning processes will need major attention. The main administrative problems have to do with the delegation of decision-making powers to municipal and school levels.

Other general problems will include: responding to the need for educated persons in Finnish society by taking into account of the changes in the employment structure, the new competencies required, new patterns of education, and the diminishing age cohorts; the relevance of structure and content in curricula to individual and national development; availability of well-educated teachers to implement the intended programs, given the increasing attraction of work in other sectors; and the feasibility of planned innovations, in terms of financial and human resources, quantitative and qualitative processes, and not least in terms of student attainments, attitudes, and interest.

## 5. COMPUTER EDUCATION IN FINLAND

### 5.1. Computer Education as a Separate Subject in the Comprehensive and Upper Secondary Schools

Facultative courses in Computer Education have been offered in Finnish Upper Secondary Schools since 1984 and on the Upper Level of the comprehensive schools since 1987. The decision to grant Computer Education the status of an independent subject of instruction was reached on the following grounds

- a separate subject was a convenient means to organize the necessary instruction
- a separate subject required only a small group of teachers (Computer Education teachers) to be given the necessary training
- the fact that Computer Education is an independent subject obliges the authorities to take it into account when allocating funds for equipment purchase and deciding upon resources for programs, space, and hours of instruction

The objectives set for computer education:

- (1) prepare students for active and critical participation in an information society
- (2) promote the general development of education necessary to meet the new requirements of modern society

The first objective comprises

- ability to use computers and software
- acquiring knowledge of the processes in computing
- general knowledge of the applications of computing
- understanding the social and political significance of computers

The second objective includes

- improvement of all instruction in accordance with the requirements of new skills set by the information society
- teaching students how to acquire information instead of feeding them facts to memorize
- enabling the individual student to make choices about quantity and content of the material as well as about methods and pace of study

The first of these two objectives can be achieved by Computer Education as an independent subject. Improving the ability to think in more depth and obtaining the skill in using computers will remain insufficient, though. Also, it is possible that a wrong impression of computers as a separate, unconnected social phenomenon will be given. Within the frame work of Computer Education as an independent subject the second objective remains almost completely unattainable.

Within the field of Computer Education the main interest at the moment is in the teaching itself. A future objective, though, in the long run, is to advance the integration of Computer Education in all instruction. It will demand extensive training in computers for all teachers and involve a thorough curricular reform covering the appropriate implantation of the various areas of Computer Education into the instruction of other subjects. The main problem to be solved when striving toward reaching the second objective of Computer Education is adapting the mode of instruction of diverse other subjects taught to the standards set by the modern information society. It is an immensely important task to further the use of the computer in education because the influence of and, on the other hand, the problems related to the use of computers in education are outspokenly greater than if just another separate subject was added to the curriculum.

The general objectives of Computer Education are to

- provide positive learning experiences, which support the learner's self-esteem, in the use of computers
- present an overview of the socio-historical significance of the computer
- help understand the practical applications of computers today and prepare the student for using them
- help see the possibilities and restrictions related to

computers

- encourage the student to independently acquire knowledge and skills in using computers

## 5.2. Computer Education in Finnish Schools in the School Year of 1987-1988

### 5.2.1. Upper Level of the Comprehensive School

On the Upper Level the curriculum consists of six courses of the following contents:

#### Course 1. Fundamentals of data processing

Contents: Getting acquainted with the use of the computer, controlling the computer, applications and social implications of computers.

#### Course 2. The computer as a means of expression

Contents: verbal expression, visual expression, music and speech.

#### Course 3. Data-Base Management and Networking

Contents: Data-Base programs, Local Area Networks, spreadsheeting and integrated programs

#### Course 4. Programming

Contents: Using the equipment and manuals; programs, e.g. variables, if-sentences, retrieval, graphics programs, problem solving with a computer. Languages:

Basic, Logo, Pascal etc.Contents:

Course 5. Automation

Contents: Computers used in measuring, managing processes and robotics.

Course 6. Technical course about computers "Computer and how it is employed"

Contents: Central Processing Unit, peripheral devices, architect of computer systems etc.

In the school year of 1987-8 the aforementioned courses were offered as presented:

|           | Course |     |    |    |   |    |     |
|-----------|--------|-----|----|----|---|----|-----|
|           | 1      | 2   | 3  | 4  | 5 | 6  | N   |
| 8th grade | 398    | 334 | 81 | 64 | 6 | 16 | 399 |
| 9th grade | 8      | 16  | 44 | 36 | 1 | 9  | 51  |

Courses planned for the school year 1988-9:

|           | Course |     |     |     |    |    |     |
|-----------|--------|-----|-----|-----|----|----|-----|
|           | 1      | 2   | 3   | 4   | 5  | 6  | N   |
| 8th grade | 384    | 353 | 80  | 63  | 8  | 12 | 399 |
| 9th grade | 13     | 86  | 327 | 341 | 38 | 44 | 376 |

### 5.2.2. Upper Secondary Schools

In 1987-8 instruction in Computer Education was organized as stipulated by the 1985 curricular decrees. Accordingly the following Computer Education courses were offered in Finnish Upper Secondary Schools:

#### Course 1. Fundamentals of computing

Contents: Getting acquainted with the use of computers, applications and social implications of computing, controlling the computer, verbal and visual expression, music and speech, using database (filing programs/cabinet) and spread sheet programs.

#### Course 2. Programming

Contents: Using the equipment and manuals; programs, e.g. variables, if-sentences, retrieval, graphics programs, problem solving with a computer. Languages: Basic, Logo, Pascal etc.

#### Course 3. Advanced courses, applications

Contents: Each upper secondary school offers advanced courses according to its resources. The contents depend on the interests and restrictions of the individual school and the surrounding community.

In the school year 1987-8 the aforementioned courses were offered as presented:

|                 | Course |     |    |     |
|-----------------|--------|-----|----|-----|
|                 | 1      | 2   | 3  | N   |
| 1. (10th) grade | 356    | 57  | 7  | 359 |
| 2. (11th) grade | 34     | 126 | 27 | 156 |
| 3. (12th) grade | 5      | 6   | 4  | 11  |

Courses planned for the school year 1988-9:

|                 | Course |     |    |     |
|-----------------|--------|-----|----|-----|
|                 | 1      | 2   | 3  | N   |
| 1. (10th) grade | 318    | 68  | 12 | 323 |
| 2. (11th) grade | 36     | 233 | 50 | 264 |
| 3. (12th) grade | 7      | 11  | 16 | 26  |

#### Selected Computer Education Courses

In 1987-8 Computer Education was offered as a facultative subject in Finnish Upper Levels (grades 8 and 9), and throughout the Upper Secondary Schools (grades 10-12). The numbers of students who selected Computer Education:

|              | percentage | female/male |
|--------------|------------|-------------|
| 8th (grade)  | 60         | 40/60       |
| 9th (grade)  | 49         | 40/60       |
| 10th (grade) | 48         | 51/49       |
| 11th (grade) | 27         | 43/57       |
| 12th (grade) | 35         | 45/55       |

### 5.3. Hardware

In most Upper Level and Upper Secondary Schools the Computer Education equipment is situated in a classroom assigned to Computer Education (87%). The usual set-up consisted of one plus eight computers - one for the teacher and eight for the students. Since Computer Educations had been initiated in Upper Secondary Schools in 1985 many of them still had out-of-date PCs with the CP/M operating system. A total of about 4000 PCs were used in the Upper Secondary Schools, c. 2500 of which with the CP/M operating system. Due to the later introduction of Computer Education in the Upper Level Schools the majority of hardware were MS-DOS (c. 2700), and the CP/M operating system devices were in the minority (c. 2200). Total of devices in the Upper Level Schools was c. 5000. Furnishing the schools with new hardware will not take long and CP/M devices will probably disappear from schools within the next few years.

At present (January 1989) schools are provided usually with At-level micros with VGA-display and at least 20 Megabyte harddrive. School supplies in Finland are subsidized from government funds, which obliges the schools to purchase IBM compatible PCs for school use. This restriction was made in order to ensure some degree

of commercial success for the production of domestic educational programs.

#### 5.4. Software

The number of educational programs is minimal, wherefore the instruction in Computer Education has been carried out with utility programs. Five most central ones were: word processing, spread sheeting, database, graphics, and music.

The most common word processing program was Word Star (in c. 50% of the schools), followed by Teko/3/Plus, Word Perfect, Writing Assistant etc. In spread sheeting the most popular choice was CalcStr, followed by MultiPlan; in filing programs the ones most frequently selected were Tiedonhaku, Tietolipasto, Filing Assistant, and DBase2/3. Paintbrush was the most common choice in graphics.

#### 5.5. Summary of Computer Education in Finnish Upper Level and Upper Secondary Schools

About 80% of Finnish Upper Level Schools offered facultative courses in Computer Education in the school year of 1987-8. It immediately became a popular choice among students although in most schools Computer Education was offered for the first time. As many as 60% of the students took Computer Education.

Nearly all Upper Secondary Schools have offered courses in Computer Education, and about a half of the students selected it.

Schools have the average of ten devices which are usually located in the Computer Education classroom. In the Upper Secondary Schools a little more than half the machines are CP/M from a few years back, whereas in the Upper Level Schools the majority are IBM compatible. The ones purchased now are always IBM compatible and hard disk machines. Furnishing the Upper Secondary Schools with appropriate hardware is the principal task at the present but on the whole we can anticipate the renewal of the hardware to have taken place in almost all schools by 1990.

The standard of the software available is not equal to the hardware, particularly not in the Upper Level Schools. Since no national guidelines for software exist schools have not purchased up-to-date software for their equipment.

The basic instruction in Computer Education seems in the light of the statistics presented to have been well in hand in 1987-8. It is a great accomplishment when the fact that the training of teachers for Computer Education was initiated in 1985 and was not given more

extensively until 1986 - 1987. Often such teachers who had no hardware at their disposal yet received training. The training was opportune in that at that time the switch over to IBM compatible PCs was taking place. Thus the training could immediately be up-to-date. At the same time, though, we have arrived in a situation where only few teachers are able to really benefit from using a computer in their work, and where the use of a computer in instruction is actually exceptional. Shifting the emphasis to training large groups of teachers and launching computer-assisted teaching are now of primary importance. In order to promote the expansion of Computer Education some essential requirements have to be fulfilled. Firstly, teachers need to be trained. The schools need to be provided with more hardware and, above all, with competent and appropriate software. The lastmentioned requirement may well be the most difficult one.

The content of the courses covers fairly well the utility properties of computing. Teachers in general are inclined to receive training in computing. They regarded Computer Education as a means to revive instruction and considered its potential in teaching strong and its introduction well-founded. Teachers were, on the other hand, doubtful about the computer making the instruction more effective. The main problem was seen in the

training, which teachers considered insufficient. Teachers have adopted a waiting attitude - Computer Education is accepted but its real worth, or worthlessness, is yet to be found out. Teachers are realistic in their skepticism, but willing to make use of computers once the input-output proves advantageous and concrete results supporting the use of computers in instruction can be presented.

#### 5.6. Lower Level of the Comprehensive School

On the Lower Level of the Comprehensive School (basic school: grades 1-6) the use of computers and any instruction in Computer Education was only incidental. No official national Computer Education curriculum exists for the Lower Level Schools. In fact the use of computers is limited only to few enthusiastic teachers. The training takes place mostly in extracurricular computer clubs, in which the students get to know computers as utilities through word processing and LOGO programming etc., rather than getting to know educational software. Obstacles to more extensive utilization of computers are the lack of training for teachers as well as the lack of hardware and appropriate software. A more comprehensive training of Lower Level teachers will begin in 1989 and 1990, which calls for allocation of funds for hardware to the Lower Level

Schools. This may well be materialized since the Upper Secondary and Upper Level Schools will be to a large extent furnished by that time. The training of the Lower Level School teachers will be a major undertaking because of their large number (c. 25 000). Computer Education on the Lower Level of the Comprehensive School needs to be given special attention to since it is during those early school years that modes of thinking and patterns of behavior are largely acquired.

#### 6. COMPUTER EDUCATION IN FINLAND 1995 - A VISION OF THE FUTURE

##### The Lower Level of the Comprehensive School

Every school is furnished with computer hardware, the use of which is familiar to the teachers. but the skills required are learned in different classes by using utility programs. Educational programs serve to visualize and individualize the teaching in schools. The learning process of an individual student is furthered through analyses made with the help of educational programs. Each young student is well grounded in the use of a computer and those interested are given a chance to further develop their skills in extracurricular clubs.

### The Upper Level of the Comprehensive School

Each school houses one or several Computer Labs as well as numerous PCs in the various classrooms. Computer Education as such comprises an introduction to the use of computers in school as well as an analysis of the social significance of the computer. Computer Education is no longer taught as a separate subject. The introduction is organized as a concise survey course which all students take. In addition to the introductory course further courses in Computer Education are offered which are aimed at familiarizing the student with the diverse uses of the computer. The instruction given is closely connected with the interests of industry and business in different parts of the country and varies according to the local economic life.

All instruction benefits from the fact that the learning environment and methods are individualized to a greater extent than in traditional instruction, which promotes the learning process. The computer is a natural aid and supportive instrument in education and it is made use of when it provides the best learning environment.

Interaction with the world outside school, e.g. databases, is extensive and the material of study is partially in electronic form. Work with projects and in various groups gains importance as a method of instruction.

With the help of the computer teaching is differentiated and analyses of learners' results enable the individualized guidance needed. Computers are widely used in problem solving and generating learner-centered methods of instruction as well as in integration.

#### Upper Secondary Schools

Computer Education is organized along the same lines as in the Upper Level of the Comprehensive School. Data Management and information retrieval are emphasized. An increasing part of learning takes place outside school: at home, at a terminal etc. The syllabus is extensive although only one course in the Fundamentals of Computing is obligatory. Part of the studies is closely connected with the local industry and commerce and demands intensive cooperation with the local enterprises, vocational schools and institutes of higher learning. Each student is assigned a PC. Academic performance is no longer restricted to the physical school building but can through flexible communications be effectively pursued outside the school, e.g. at home.

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